Report of the Kew Observatory Committee for the Year ending December 31, 1899.

The operations of the Kew Observatory, in the Old Deer Park, Richmond, Surrey, are controlled by the Kew Observatory Committee, which is constituted as follows :—

Mr. F. Galton, *Chairman.*

Captain Sir W. de W. Abney, K.C.B., R.E.	Prof. A. W. Rücker.
Prof. W. G. Adams.	Dr. R. H. Scott.
Captain E. W. Creak, R.N.	Mr. W. N. Shaw.
Prof. G. C. Foster.	Lieut.-General Sir R. Strachey, G.C.S.I.
Prof. J. Perry.	Rear Admiral Sir W. J. L. Wharton, K.C.B.
The Earl of Rosse, K.P.	

The work at the Observatory may be considered under the following heads :—

I. Magnetic observations.
II. Meteorological observations.
III. Seismological observations.
IV. Experiments and Researches in connexion with any of the departments.
V. Verification of instruments.
VI. Rating of Watches and Marine Chronometers.
VII. Miscellaneous.

I. Magnetic Observations.

The Magnetographs have been in constant operation throughout the year, and the usual determinations of the Scale Values were made in January.

The ordinates of the various photographic curves representing Declination, Horizontal Force, and Vertical Force were then found to be as follows :—

Declinometer : 1 cm. = 0° 8′·7.

Bifilar, January, 1899, for 1 cm. δH = 0·00051 C.G.S. unit.

Balance, January, 1899, for 1 cm. δV = 0·00052 C.G.S. unit.

In the case of the Vertical Force instrument it was found necessary to re-adjust the magnet, and at the same time its sensibility was slightly altered, after which the scale value was again determined with the following result:—

Balance, January 26th, 1899, for 1 cm. $\delta V = 0{\cdot}00049$.

With regard to magnetic disturbances, no very large movements have been registered during the year. Some of the principal oscillations recorded took place on the following dates:—

January 28—29; February 12; March 10, 22, and 23;
April 18—19; May 3—5; June 27—29;
September 26—27; and October 23.

The hourly means and diurnal inequalities of the magnetic elements for 1899, for the quiet days selected by the Astronomer Royal, will be found in Appendix I. A correction has been applied for the diurnal variation of temperature, use being made of the records from a Richard thermograph as well as of the eye observations of a thermometer placed under the Vertical Force shade.

The mean values at the noons preceding and succeeding the selected quiet days are also given, but these of course are not employed in calculating the daily means or inequalities.

The following are the mean results for the entire year:—

Mean Westerly Declination.....	16° 57′·1.
Mean Horizontal Force	0·18393 C.G.S. unit.
Mean Inclination	67° 14′·7.
Mean Vertical Force.....	0·43852 C.G S. unit.

In September, in consequence of an accident, the two dip needles long in use had to be replaced by two others obtained from Mr. A. W. Dover in 1897. As a careful comparison of the data obtained before and after the accident showed that the difference of the inclinations given by the new and old needles if existent was less than the probable error of observation, no correction has been applied.

Observations of Absolute Declination, Horizontal Intensity, and Inclination have been made weekly, as a rule.

A table of recent values of the magnetic elements at the Observatories whose publications are received at Kew will be found in Appendix Ia.

A course of practical instruction in the taking of magnetic observations has been given to Mr. Henkel, of Markree Observatory, and to Lieutenants Nares and Waugh, of the Royal Navy. The method of reducing the vertical force curves has been explained to Mr. Kitto, Superintendent of Falmouth Observatory.

Captain Creak, R.N., made some preliminary experiments with a modified form of Fox Circle, and Captain Denholm Fraser, R.E.,

experimented on the relative merits of silk and phosphor bronze as the suspension for magnets.

Open scale magnetographs, devised by Mr. W. Watson for the purpose of testing the disturbing action of electric railways, were in operation for a few days in December under Mr. Watson's supervision.

Dr. van Rijckevorsel visited the Observatory in June and September, and observed with his magnetic instruments, in pursuance of his scheme for the intercomparison of standard instruments at various Observatories.

Dr. L. A. Bauer also took magnetic observations in September and November with instruments belonging to the U.S. Coast and Geodetic Survey.

Advice has been given to Captain Fraser, R.E., with respect to the equipment for a magnetic survey of India, and to the Surveyor General, Wellington, New Zealand, in relation to the erection of a magnetic observatory in New Zealand, and the carrying out of a magnetic survey there. At the request of the Agent General, a complete set of magnetographs has been ordered from Mr. P. Adie for New Zealand, and the unifilar magnetometer and dip circle, previously lent to Melbourne Observatory, have been lent for two years to the New Zealand Government.

During the absence of Mr. T. W. Baker on inspection work during part of September and October, the magnetic work was intrusted to Mr. R. Forsyth, Royal College of Science, who was temporarily engaged for the purpose.

The magnetic work as a whole has been unusually onerous throughout the year, and it seems likely to continue heavy for some time, as an exceptionally large number of magnetic instruments have been ordered by foreign and colonial institutions with the expressed intention of having them verified at the Observatory.

Opportunities present themselves from time to time of getting valuable observations made by travellers and others if they are supplied with the necessary instruments. In order to be able to take advantage of such opportunities, by lending instruments to competent observers, when it may seem desirable to do so, the Committee have obtained a unifilar magnetometer and a dip circle from Mr. A. W. Dover. The expense was defrayed by a special grant, amounting to £86 5*s.*, from the Government Grant Committee.

II. Meteorological Observations.

The several self-recording instruments for the continuous registration of Atmospheric Pressure, Temperature of Air and Wet-bulb, Wind (direction and velocity), Bright Sunshine, and Rain have been maintained in regular operation throughout the year, and the

standard eye observations for the control of the automatic records have been duly registered. The monthly mean values are given in Appendix II.

The tabulations of the meteorological traces have been regularly made, and these, as well as copies of the eye observations, with notes of weather, cloud, and sunshine, have been transmitted, as usual, to the Meteorological Office.

With the sanction of the Meteorological Council, data have been supplied to the Council of the Royal Meteorological Society, the Institute of Mining Engineers, and the editor of 'Symons' Monthly Meteorological Magazine.'

Electrograph.—This instrument worked generally in a satisfactory manner during the year.

The "setting" of the electrometer needle, mentioned in last year's 'Report,' has been considerably reduced, and the working of the instrument improved, by the removal of the large glass cup, with a diameter of 100 mm.—used for holding the sulphuric acid—and the substitution for it of a small glass beaker, with a diameter of 40 mm., resting upon a disc of paraffin, and containing about 35 c.c. of acid. The acid and accumulated moisture is removed at frequent intervals.

Scale value determinations were made on January 24, May 12, July 21, and November 7, and in addition the potential of the battery has been tested weekly. Forty cells only have been employed throughout the year.

A battery of thirty-six Clark cells has been purchased from Messrs. Muirhead on behalf of the Meteorological Council, with the hope of thereby introducing greater certainty into the interpretation of the records.

With the sanction of the Meteorological Council, the electrograms for the year 1897 have been lent to Mr. C. T. R. Wilson, of Sidney-Sussex College, Cambridge.

Inspections.—In compliance with the request of the Meteorological Council, the following Observatories and Anemograph Stations have been visited and inspected:—Stonyhurst, Fleetwood, Armagh, Dublin, Valencia, Falmouth, and Fort William, by Mr. Baker; and Radcliffe Observatory (Oxford), Yarmouth, North Shields, Glasgow, Aberdeen, and Deerness (Orkney), by Mr. Constable.

III. Seismological Observations.

Professor Milne's "unfelt tremor" pattern of seismograph has been maintained in regular operation throughout the year; particulars of the time of occurrence and the amplitude in seconds of arc of the largest movements are given in Appendix III, Table I.

The disturbance (No. 145) on September 10 was particularly notice-

able; the range was beyond the limits of the instrument to record definitely, but the maximum exceeded 11 seconds of arc.

During November the action of the boom became sluggish, and the records for some time were doubtful. It was ultimately found, after consultation with Professor Milne, that a part of the edge of the agate cup resting on the pivot was scratched and jagged. This defect was remedied by moving the weight and tie piece round through 45°, and so bringing a different part of the agate cup on to the pivot. The general working has since been satisfactory.

The remarks made in last year's 'Report' as to the uncertainty of the time measurements still hold good, and no attempt is made to give these values to nearer than 0·1 minute.

A detailed list of the movements recorded from April, 1898, to March, 1899, was made and sent to Professor Milne, and will be found in the 'Report' of the British Association for 1899, "Seismological Investigations Committee's Report."

It is proposed to tabulate the disturbances for the remainder of 1899 in a similar manner.

IV. Experimental Work.

Fog and Mist.—The observations of a series of distant objects, referred to in previous 'Reports,' have been continued. A note is taken of the most distant of the selected objects which is visible at each observation hour.

Atmospheric Electricity.—The comparisons of the potential, at the point where the jet from the water-dropper breaks up, and at a fixed station on the Observatory lawn, referred to in last year's 'Report,' have been continued, and the observations have been taken three or four times every month.

Platinum Thermometry.—The results of the comparison of platinum and gas thermometers at Sèvres, referred to in last year's 'Report,' were worked up by Dr. Chappuis and Dr. Harker, and embodied in a paper which was read before the Royal Society in June and will appear in the 'Philosophical Transactions.'

The experiments which were begun in 1895 into the constancy and general behaviour of platinum thermometers have led to the accumulation of a large number of results. These have been dealt with by the Superintendent in a critical paper, which was recently read before the Royal Society.

Towards the end of the year an oil-bath was constructed, from the designs mainly of Dr. Harker, for the purpose of comparing thermometers at high temperatures. Some preliminary comparisons have already been made in it of a few German and English mercury standards with a platinum thermometer.

V. Verification of Instruments.

The subjoined is a list of the instruments examined in the yea 1899, compared with a corresponding return for 1898 :—

	Number tested in the year ending December 31.	
	1898.	1899.
Air-meters	1	6
Anemometers	11	23
Aneroids	169	175
Artificial horizons	9	9
Barometers, Marine	122	92
„ Standard	58	85
„ Station	55	15
Binoculars	374	404
Compasses	44	43
Deflectors	3	6
Hydrometers	463	241
Inclinometers	5	9
Photographic Lenses	13	160
Magnets	2	3
Navy Telescopes	681	561
Rain Gauges	12	19
Rain-measuring Glasses	10	44
Scales	2	—
Sextants	750	876
Sunshine Recorders	15	6
Theodolites	26	24
Thermometers, Avitreous or Immisch's	10	5
„ Clinical	17,962	16,020
„ Deep sea	79	19
„ High Range	56	62
„ Hypsometric	38	39
„ Low Range	94	103
„ Meteorological	3,296	2,892
„ Solar radiation	2	—
„ Standard	66	104
Unifilars	6	5
Vertical Force Instruments	—	1
Declinometers	—	—
Total	24,434	22,051

Duplicate copies of corrections have been supplied in 97 cases.

The number of instruments rejected in 1898 and 1899 on account of excessive error, or for other reasons, was as follows :—

	1898.	1899.
Thermometers, clinical	173	149
„ ordinary meteorological ...	92	78
Sextants	106	151
Telescopes	60	49
Binoculars	30	21
Various	26	14

Two Standard Thermometers have been constructed during the year.

There were at the end of the year in the Observatory, undergoing verification, 6 Barometers, 450 Thermometers, 24 Sextants, 150 Telescopes, 75 Binoculars, 6 Hydrometers, 2 Rain Measures, 2 Rain Gauges, and 2 Unifilar Magnetometers.

VI. Rating of Watches and Chronometers.

The number of watches sent for trial this year is slightly less than in 1898, the total entries being 469, as compared with 483 in the preceding year.

The "especially good" class A certificate was obtained by 78 watches. The highest number of marks obtained is a fraction lower than the highest obtained in 1898, but the average performance shows no falling off, as appears from the following figures showing the percentage number of watches obtaining the distinction "especially good," as compared to the total number obtaining class A certificates :—

Year	1894.	1895.	1896.	1897.	1898.	1899.
Percentage "especially good"	16·1	16·6	30·5	28·0	22·1	26·6

The 469 watches received were entered for trial as below :—

For class A, 362 ; class B, 86 ; and 21 for the subsidiary trial. Of these 19 passed the subsidiary test, 62 were awarded class B, and 293 class A certificates, while 95 failed from various causes to gain any certificate.

In Appendix IV will be found a table giving the results of trial of the 50 watches which gained the highest number of marks during the year. The highest place was taken by Messrs. S. Smith & Son, 9, Strand, London, with a keyless fusee tourbillon lever watch, No. 238–99, which obtained 88·7 marks out of a maximum of 100.

Marine Chronometers.—During the year, 56 chronometers have been entered for the Kew A trials ; of these 34 gained certificates, and 22 failed.

No movements were sent in for the class B trials, and as the demand

for the B certificate has been very small indeed for some years past, the question of the retention of the class B trial seems to require consideration.

The electrical contact-piece of the mean-time clock "French" failed in its action frequently in the early part of the year. This was found to be mainly due to the unequal wearing of the teeth of the old escape wheel. The clock was sent to Messrs. Dent, who fitted a new escape wheel, &c., and its general performance since has been much more satisfactory.

VII. Miscellaneous.

Commissions.—The work under this heading has been of a very varied character during the year. The following instruments have been procured, examined, and forwarded to the various Observatories on whose behalf they were purchased:—

1 dip circle and 4 extra needles for St. Petersburg.
1 „ „ 1 pair „ Toronto.
2 pairs dip needles for Upsala.
1 pair „ „ Mauritius.
1 Kew pattern self-recording Robinson anemometer and sheets, and 1 pocket aneroid for St. Petersburg.
2 Kew standard thermometers and a barograph tabulator for Colaba (Bombay).
A standard Fortin barometer, an astronomical globe, maximum and minimum thermometers, and an ozone cage for Mauritius.

Anemograph sheets, sunshine cards, and rain-gauge forms have been sent to Hong Kong and Mauritius; prepared photographic paper to Batavia, Aberdeen, Fort William, and Valencia, for the Meteorological Office; and to Hong Kong, Mauritius, Toronto, and Lisbon.

Gas Thermometer.—The instrument referred to in last year's 'Report' arrived at the Observatory in February. Prior to its receipt, Dr. J. A. Harker went over to Germany and was shown the methods of using the gas thermometer adopted at the Reichsanstalt, Charlottenburg. The Committee are much indebted to Dr. Kohlrausch and other authorities of the Reichsanstalt for the courtesy shown by them on this occasion. The cost of the instrument, including its carriage and Dr. Harker's expenses at Berlin, was borne by Sir A. Noble, who also kindly expressed his willingness to pay for the auxiliary appliances required in gas thermometry. Owing to the want of a suitable building in which to erect the gas thermometer, the Committee were unable to take full advantage of Sir Andrew's generous offer for the immediate present, and they have been obliged to leave it to their successors, the Executive Committee of the National Physical Labora-

tory, to carry out the final arrangements for the installation of the gas thermometer.

Collimator Magnets.—A critical and experimental paper dealing with the data obtained in the verification of collimator magnets at the Observatory during the last forty years was prepared by the Superintendent, and has been published in the Royal Society's 'Proceedings.'

Discussion on Platinum Thermometry.—A discussion on platinum thermometry having been arranged for the British Association meeting at Dover, Dr. Harker attended, with the Committee's approval, and in concert with Dr. Chappuis gave a summary of their joint work at Sèvres.

Professor Carey Foster and Mr. Shaw also took part in the debate as well as the Superintendent, who had been instructed by the Committee to attend.

Compass-testing Regulations.—In consequence of representations by Mr. J. White, of Glasgow, the regulations for the testing of ships' compasses have been revised. In this process the Committee had the advantage of the advice of Lord Kelvin and Captain Creak, whose views were laid before a sub-committee appointed for the purpose.

At the request of the Danish Legation, the methods employed at the Observatory for the verification of compasses, sextants, and naval telescopes were shown to Commander Clausen, of the Royal Danish Navy, who has charge of the verification of naval instruments at Copenhagen.

National Physical Laboratory.—Parliament having, on the motion of Her Majesty's Ministers, voted a sum of money for the establishment of a National Physical Laboratory, to be under the management of a committee nominated by the Council of the Royal Society, the Royal Society have drawn up, and the Government have approved, a scheme for the organisation of the Laboratory. In accordance with this scheme, the Kew Observatory is incorporated with the National Physical Laboratory, and becomes part of the organisation thereof as from the 1st January, 1900. The Kew Observatory Committee as hitherto constituted ceases to exist at the same date, and its property is to be transferred to the Royal Society. The work of the Observatory will, however, proceed as heretofore, and will be carried on by the existing staff.

The scheme of organisation already mentioned constitutes an Executive Committee as the authority having the immediate management of the National Physical Laboratory, and this Committee includes at present six members of the Kew Observatory Committee. The scheme also provides for the appointment of a Director, who, subject to the authority of the Executive Committee, is to have sole control and direction of the officials of the National Physical Laboratory and of the work done within it. Mr. R. T. Glazebrook, F.R.S., has been appointed to this office.

The Kew Observatory Committee having been incorporated under the Companies Act, 1867, certain legal forms have to be complied with in order to wind it up, transfer its property to the Royal Society, and put an end to its liabilities. The steps required for these purposes are being taken.

Inspection of the Observatory.—An inspection by the General Board of the National Physical Laboratory was arranged for October 16th and 18th, when the Chairman and some other members of the Kew Committee attended at the Observatory to assist in showing it to their visitors. On the second occasion the Observatory was visited by fully twenty members of the General Board, including the Vice-Chairman of the Executive Committee and the Director of the National Physical Laboratory. By the courtesy of the Mid-Surrey Golf Club, arrangements were made for examining the most likely sites for building afforded by the Old Deer Park.

Library.—During the year the library has received publications from—

21 Scientific Societies and Institutions of Great Britain and Ireland,

103 Foreign and Colonial Scientific Establishments, as well as from several private individuals.

The card catalogue has been proceeded with.

Audit, &c.—The accounts for 1899 have been audited by Messrs. W. B. Keen & Co., Chartered Accountants.

The balance sheet, with a comparison of the expenditure for the two years 1898 and 1899, is appended.

Personal Establishment.

The staff employed is as follows:—

C. Chree, Sc.D., F.R.S., Superintendent.
T. W. Baker, Chief Assistant.
E. G. Constable, Observations and Rating.
W. Hugo, Verification Department.
J. Foster ,, ,,
T. Gunter ,, ,,
W. J. Boxall ,, ,,
G. E. Bailey, Accounts and Library.
E. Boxall, Observations and Rating.
G. Badderly, Verification Department, and six other Assistants.
A Caretaker and a Housekeeper are also employed.

In addition to the above, Dr. J. A. Harker has been employed in the capacity of special assistant to the Superintendent.

(Signed) G. CAREY FOSTER,
Interim Chairman.

List of Instruments, Apparatus, &c., the Property of the Kew Observatory Committee, at the present date out of the custody of the Superintendent, on Loan.

To whom lent.	Articles.	Date of loan.
G. J. Symons, F.R.S.	Portable Transit Instrument	1869
The Science and Art Department, South Kensington.	Articles specified in the list in the Annual Report for 1893.....	1876
Professor W. Grylls Adams, F.R.S.	Unifilar Magnetometer, by Jones, No. 101, complete.....	1883
	Pair 9-inch Dip Needles with Bar Magnets ...	1887
Lord Rayleigh, F.R.S.	Standard Barometer (Adie, No. 655)	1885
Radcliffe Observatory, Oxford.	Black Bulb Thermometer *in vacuo*	1897
The Borchgrevink-Newnes Antarctic Expedition.	Dip Circle, by Barrow, No. 24, with four Needles and Bar Magnets.....	1898
The New Zealand Government.	Unifilar Magnetometer, by Jones, marked N.A.B.C., complete.....	1899
	Dip Circle, by Barrow, with one pair of Needles and Bar Magnets.....	1899
	Tripod Stand	1899
C. T. R. Wilson, Esq., Cambridge.	Electrograms for 1897	1899

Kew Observatory. Account of Receipts and Payments (including those of the Liquidator since December 1st) for the year ending December 30, 1899.

RECEIPTS.

	£	s.	d.	£	s.	d.
To Balance from Year 1898				650	9	4
Royal Society:—						
Gassiot Trust. Annual payment	440	16	10			
,, ,, Income Tax returned	14	19	9			
				455	16	7
Meteorological Council:—						
Allowance	400	0	0			
Postages, &c.	5	10	6			
Set of Clark's Standard Cells	23	8	0			
				428	18	6
Tests:—						
Verification	1616	16	5			
Rating	516	11	0			
Lenses	42	8	10			
				2175	16	3
Researches:—						
London and South Western Railway Company—Compensation for broken bell-jar				10	0	
Commissions executed for Colonial and Foreign Institutions, &c.				470	5	2
Rents				7	3	0
Dividends on India Stock				43	19	8
Gas Thermometer—Sir Andrew Noble's contribution				75	0	0
Government Grant Committee for Magnetic Instruments for Loan				86	5	0
				£4394	3	6

PAYMENTS.

	£	s.	d.	£	s.	d.
By Normal Observatory:—						
Salaries—Observations, Tabulations, &c.	349	15	3			
Incidental Expenses, Apparatus, Photographic Paper, &c.	74	18	11			
Proportion of Administration Expenditure	194	10	0			
				619	4	2
Researches:—						
Salaries	204	11	10			
Incidental Expenses, &c.	28	10	7			
Proportion of Administration Expenditure	389	0	0			
				622	2	5
Tests:—						
Salaries	969	18	0			
Incidental Expenses, &c.	156	12	0			
Proportion of Administration Expenditure	584	11	4			
				1711	1	4
Commissions:—						
Purchase of Instruments and Photographic Paper for Colonial and Foreign Institutions, &c.	340	10	6			
Proportion of Administration Expenditure	130	0	0			
				470	10	6
Gas Thermometer:—						
Apparatus and Carriage from Berlin	64	16	0			
Expenses of Dr. Harker's visit to Berlin	9	15	0			
				74	11	0
Mr. A. W. Dover—Magnetic Instruments for Loan				86	5	0
Balance—London and County Bank	766	14	9			
Awaiting Banking	19	5	6			
In hand (Petty Cash)	24	8	10			
				810	9	1
				£4394	3	6

Audited on behalf of the Royal Society and found correct,
18th January, 1900.
(Signed) W. B. KEEN, *Chartered Accountant.*

ADMINISTRATION EXPENDITURE.

Particulars.	£	*s.*	*d.*
Superintendent	500	0	0
First Assistant, Librarian, &c.	457	7	9
Rent, Fuel, &c.	96	4	4
Caretaker, Repairs, &c.	244	9	3
	£1298	1	4

Apportionment.	£	*s.*	*d.*
Observatory	194	10	0
Researches	389	0	0
Tests	584	11	4
Commissions	130	0	0
	£1298	1	4

ESTIMATED ASSETS.

	£	*s.*	*d.*	£	*s.*	*d.*
By Balance as per Statement				810	9	1
£1300 India 3½ per cent. Stock, value on January 1, 1900				1430	0	0
Payments due:—						
Meteorological Council—Allowance, Postages, &c.	100	15	4			
Test Fees	563	17	5			
Commissions, &c.	22	2	0			
				686	14	9
Stock:—						
Blank Forms and Certificates	53	16	5			
Standard Thermometers	79	8	0			
				133	4	5
				£3060	8	3

January 19th, 1900.

ESTIMATED LIABILITIES.

	£	*s.*	*d.*
To Administration accounts—Gas, Water, Repairs, &c.	34	15	10
Observatory accounts—Photographic Paper, &c.	6	18	1
Tests accounts	11	17	2
Commissions	17	16	2
Researches		3	3
Unspent balance of Grant for Seismograph	4	5	0
,, ,, Sir Andrew Noble's contribution to Gas Thermometer		9	0
General Balance	2984	3	9
	£3060	8	3

(Signed) CHARLES CHREE,
Superintendent.

Comparison of Expenditure during the Years 1898 and 1899.

Expenditure.	1898.			1899.			Increase.			Decrease.		
	£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*
Administration :—												
Superintendent.....	500	0	0	500	0	0						
First Assistant.....	333	8	0	331	18	0				1	10	0
Office.....	121	10	0	125	9	9	3	19	9			
Rent, Fuel, Lighting, &c.	87	16	6	96	4	4	8	7	10			
Caretaker.....	68	18	0	68	18	0						
Incidental Expenses....	137	12	1	175	11	3	37	19	2			
	1249	4	7	1298	1	4	50	6	9	1	10	0
Normal Observatory:—												
Salaries—Observations, &c.....	336	15	6	349	15	3	12	19	9			
Incidental Expenses....	41	1	7	74	18	11	33	17	4			
Prop. Adm. Expenditure	187	10	0	194	10	0	7	0	0			
Researches:—												
Salaries.....	158	8	0	204	11	10	46	3	10			
Incidental Expenses.....	64	9	2	28	10	7				35	18	7
Prop. Adm. Expenditure	375	0	0	389	0	0	14	0	0			
Tests:—												
Salaries.....	918	6	0	969	18	0	51	12	0			
Incidental Expenses....	222	9	5	156	12	0				65	17	5
Prop. Adm. Expenditure	499	4	7	584	11	4	85	6	9			
Commissions:—												
Purchases for Colonial Institutions, &c.....	529	3	1	340	10	6				188	12	7
Prop. Adm. Expenditure	187	10	0	130	0	0				57	10	0
Seismograph.....	55	15	0							55	15	0
Gas Thermometer.....				74	11	0	74	11	0			
Magnetic Instruments for Loan				86	5	0	86	5	0			
Gross Expenditure.... (showing an increase of £8 2*s.* 1*d.*).	3575	12	4	3583	14	5	411	15	8	403	13	7
Extraordinary Expenditure.												
Normal Observatory:—												
Incidental Expenses....				23	8	0	23	8	0			
Researches:—												
Salaries.....	158	8	0	204	11	10	46	3	10			
Purchase of Apparatus, &c.	61	15	10	23	19	3				37	16	7
Commissions:—												
Purchases for Colonial Institutions, &c.....	529	3	1	340	10	6				188	12	7
Seismograph.....	55	15	0							55	15	0
Gas Thermometer.....				74	11	0	74	11	0			
Magnetic Instruments for Loan.....				86	5	0	86	5	0			
	805	1	11	753	5	7	230	7	10	282	4	2
Leaving for Ordinary Nett Expenditure..... (showing an increase of £59 18*s.* 5*d.*).	2770	10	5	2830	8	10	181	7	10	121	9	5

APPENDIX I.

Magnetical Observations, 1899.

Made at the Kew Observatory, Old Deer Park, Richmond, Lat. 51° 28′ 6″ N. and Long. $0^h\ 1^m\ 15^s{\cdot}1$ W.

The results given in the following tables are deduced from the magnetograph curves which have been standardised by observations of deflection and vibration. These were made with the Collimator Magnet K.C. I. and the Declinometer Magnet marked K.O. 90 in the 9-inch Unifilar Magnetometer by Jones.

The Inclination was observed with the Inclinometer by Barrow, No. 33, and needles $3\frac{1}{2}$ inches in length.

The Declination and Force values given in Tables I to VIII are prepared in accordance with the suggestions made in the fifth report of the Committee of the British Association on comparing and reducing Magnetic Observations.

The following is a list of the days during the year 1899 which were selected by the Astronomer Royal, as suitable for the determination of the magnetic diurnal inequalities, and which have been employed in the preparation of the magnetic tables :—

January	1, 7, 10, 13, 27.
February	4, 5, 7, 8, 18.
March	4, 5, 26, 27, 30.
April	13, 15, 16, 21, 22.
May	13, 14, 24, 25, 29.
June	6, 7, 17, 25, 26.
July	15, 17, 22, 28, 29.
August	12, 16, 18, 19, 23.
September	5, 6, 7, 14, 20.
October	2, 3, 10, 20, 29.
November	2, 10, 16, 20, 27.
December	6, 11, 14, 15, 24.

Table I.—Hourly Means of the Declination, as determined from the

Hours	Preceding noon.	Mid.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
	(16° +) West						Winter.						
1899. Months.	′	′	′	′	′	′	′	′	′	′	′	′	′
Jan. ..	61·3	57·9	58·3	58·2	58·3	58·2	57·9	58·0	57·9	58·1	58·4	59·0	60·0
Feb. ..	61·4	58·0	58·1	58·1	58·0	57·9	58·0	58·0	58·1	58·5	59·1	60·1	60·6
March.	62·1	56·9	56·8	56·6	56·7	56·8	56·9	56·7	56·7	56·0	55·6	56·8	59·5
Oct. ..	59·7	55·3	55·3	55·3	55·2	55·1	55·0	54·8	54·2	53·5	53·8	55·2	57·3
Nov. ..	58·3	54·5	55·1	55·2	55·4	55·3	55·0	54·9	54·5	54·1	54·4	55·7	57·1
Dec. ..	57·5	55·0	55·1	55·1	55·2	55·3	55·3	55·1	54·9	54·9	55·0	55·5	56·3
Means	60·1	56·3	56·5	56·4	56·5	56·4	56·4	56·3	56·1	55·9	56·1	57·1	58·5
							Summer.						
	′	′	′	′	′	′	′	′	′	′	′	′	′
April..	61·5	56·9	57·0	57·2	57·1	56·7	56·6	55·9	54·8	53·6	54·2	56·3	59·1
May ..	62·3	57·0	57·0	56·8	56·6	56·1	54·9	53·9	53·0	53·1	54·7	57·2	59·8
June ..	61·6	56·8	56·7	56·5	56·5	55·7	54·3	53·0	52·6	52·6	53·3	55·5	58·1
July ..	60·2	56·4	55·8	55·7	55·4	55·0	53·9	53·6	53·6	53·1	54·1	55·7	57·9
Aug. ..	61·5	55·5	55·4	55·5	55·3	54·8	54·0	53·2	52·5	52·8	54·1	57·0	59·7
Sept..	61·6	56·1	56·0	56·2	55·9	55·7	55·3	54·7	53·6	53·4	54·4	56·4	59·4
Means	61·5	56·4	56·3	56·3	56·1	55·7	54·8	54·0	53·3	53·1	54·1	56·3	59·0

Table II.—Diurnal Inequality of the

Hours	Mid.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
					Summer Means.							
	′	′	′	′	′	′	′	′	′	′	′	′
	−0·7	−0·8	−0·8	−1·0	−1·5	−2·3	−3·1	−3·8	−4·0	−3·0	−0·8	+1·8
					Winter Means.							
	′	′	′	′	′	′	′	′	′	′	′	′
	−0·8	−0·6	−0·6	−0·6	−0·6	−0·7	−0·8	−1·0	−1·2	−1·0	0·0	+1·4
					Annual Means.							
	′	′	′	′	′	′	′	′	′	′	′	′
	−0·7	−0·7	−0·7	−0·8	−1·1	−1·5	−2·0	−2·4	−2·6	−2·0	−0·4	+1·6

Note.—When the sign is + the magnet
" " − "

selected quiet Days in 1899. (The Mean for the Year = 16° 57′·1 West.)

Noon.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Mid.	Succeeding noon.
					Winter.								
′	′	′	′	′	′	′	′	′	′	′	′	′	′
60·5	60·3	59·3	58·9	59·3	59·0	58·8	58·7	58·4	58·2	58·0	58·1	58·0	61·1
61·1	61·0	60·7	59·7	58·8	59·3	59·1	58·9	58·5	58·0	58·0	58·0	57·8	61·1
62·2	63·2	62·8	61·0	59·2	58·4	57·9	57·5	56·9	57·2	57·0	56·9	57·1	62·2
58·6	59·5	59·3	58·2	57·1	56·5	56·2	56·1	55·8	55·6	55·5	55·1	55·2	58·9
57·8	57·8	57·1	55·9	55·6	55·6	55·5	55·3	54·9	54·6	54·7	54·7	54·7	57·9
57·0	57·3	56·6	56·1	55·7	55·5	55·3	55·0	54·9	54·7	54·8	54·9	54·9	57·3
59·5	59·9	59·3	58·3	57·6	57·4	57·1	56·9	56·6	56·4	56·3	56·3	56·3	59·8
					Summer.								
′	′	′	′	′	′	′	′	′	′	′	′	′	′
62·1	63·9	63·8	62·5	60·5	59·1	57·9	56·9	57·3	57·3	57·2	57·2	57·1	61·7
62·2	62·7	62·1	60·5	58·9	58·1	57·7	57·7	57·7	57·5	57·4	57·3	57·0	63·2
61·0	62·2	62·7	61·9	60·6	59·0	58·5	57·8	57·5	57·4	57·2	57·3	56·9	61·7
60·5	61·4	61·4	60·2	59·0	57·9	57·4	57·0	57·1	56·9	56·9	56·6	56·5	61·0
61·0	61·9	60·8	59·3	58·0	56·4	55·9	56·1	56·2	56·2	55·9	55·6	55·6	62·5
61·9	62·9	62·3	60·1	58·3	57·0	56·6	56·4	56·5	56·3	56·3	56·2	56·1	62·7
61·4	62·5	62·2	60·7	59·2	57·9	57·3	57·0	57·1	56·9	56·8	56·7	56·5	62·1

Declination as deduced from Table I.

Noon	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Mid.
					Summer Means.							
′	′	′	′	′	′	′	′	′	′	′	′	′
+4·3	+5·4	+5·0	+3·6	+2·1	+0·8	+0·2	−0·2	−0·1	−0·2	−0·3	−0·5	−0·6
					Winter Means.							
′	′	′	′	′	′	′	′	′	′	′	′	′
+2·5	+2·8	+2·2	+1·2	+0·6	+0·3	+0·1	−0·2	−0·5	−0·7	−0·7	−0·7	−0·8
					Annual Means.							
′	′	′	′	′	′	′	′	′	′	′	′	′
+3·4	+4·1	+3·6	+2·4	+1·3	+0·5	+0·1	−0·2	−0·3	−0·5	−0·5	−0·6	−0·7

points to the west of its mean position.
„ east „ „

Table III.—Hourly Means of the Horizontal Force in C.G.S. units (corrected
(The Mean for the

Hours	Preceding noon.	Mid.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
0·18000 +						Winter.							
1899. Months.													
Jan. ...	381	381	382	382	384	386	388	388	388	387	380	381	381
Feb. ...	380	385	384	383	384	385	386	388	389	388	383	381	380
March ..	374	383	383	382	381	383	387	386	387	381	373	368	367
Oct. ...	387	405	406	405	405	405	407	406	405	398	392	387	387
Nov. ...	400	402	403	404	407	409	410	410	407	402	398	394	392
Dec. ...	404	407	406	407	409	410	411	411	411	410	408	406	405
Means..	388	394	394	394	395	396	398	398	398	394	389	386	385
						Summer.							
April...	363	386	386	386	387	386	388	386	383	378	372	366	362
May ...	370	394	393	393	390	390	387	384	376	367	362	361	363
June ...	376	399	397	396	395	394	395	391	387	381	377	376	377
July ...	381	397	396	396	397	397	395	391	388	383	381	379	380
Aug. ...	388	401	400	400	399	398	395	392	386	380	375	376	379
Sept. ...	381	404	405	404	403	402	401	397	390	383	374	371	376
Means..	377	397	396	396	395	394	393	390	385	379	374	372	373

Table IV.—Diurnal Inequality of the

Hours	Mid.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
					Summer Means.							
	+ ·00005	+ ·00004	+ ·00004	+ ·00003	+ ·00002	+ ·00001	− ·00002	− ·00007	− ·00013	− ·00018	− ·00020	− ·00019
					Winter Means.							
	− ·00001	− ·00001	− ·00001	·00000	+ ·00002	+ ·00004	+ ·00004	+ ·00003	·00000	− ·00005	− ·00008	− ·00009
					Annual Means.							
	+ ·00002	+ ·00002	+ ·00002	+ ·00002	+ ·00002	+ ·00003	+ ·00001	− ·00002	− ·00007	− ·00012	− ·00014	− ·00014

Note.—When the sign is + the

for Temperature) as determined from the selected quiet Days in 1899. Year = 0·18393.)

Noon.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Mid.	Succeeding noon.
						Winter.							
384	388	388	384	380	384	385	386	385	384	383	383	384	388
382	387	389	387	385	385	386	387	389	389	388	388	389	382
372	378	382	383	383	382	383	385	384	383	384	385	384	373
389	393	399	402	402	405	406	407	408	408	408	407	408	395
397	403	406	407	409	410	411	410	408	408	407	407	407	397
406	408	406	408	409	411	412	412	411	411	410	410	411	410
388	393	395	395	395	396	397	398	397	397	397	397	397	391
						Summer.							
365	371	378	386	387	388	394	391	391	392	391	390	391	363
376	385	390	391	391	392	395	399	400	397	396	396	395	378
381	386	391	396	399	400	406	409	408	406	404	402	400	380
385	388	394	399	399	401	403	407	408	406	405	403	402	386
384	390	396	398	399	402	404	410	411	410	407	407	406	385
386	394	401	404	405	406	406	408	406	405	406	406	405	381
380	386	392	396	397	398	401	404	404	403	402	401	400	379

Horizontal Force as deduced from Table III.

Noon	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Mid.
					Summer Means.							
− ·00012	− ·00006	·00000	+ ·00004	+ ·00005	+ ·00006	+ ·00009	+ ·00012	+ ·00012	+ ·00011	+ ·00010	+ ·00009	+ ·00008
					Winter Means.							
− ·00006	− ·00002	+ ·00001	+ ·00001	·00000	+ ·00002	+ ·00003	+ ·00003	+ ·00003	+ ·00003	+ ·00002	+ ·00002	+ ·00003
					Annual Means.							
− ·00009	− ·00004	·00000	+ ·00002	+ ·00003	+ ·00004	+ ·00006	+ ·00008	+ ·00007	+ ·00007	+ ·00006	+ ·00005	+ ·00005

reading is above the mean.

Table V.—Hourly Means of the Vertical Force in C.G.S. units (corrected
(The Mean for the

Hours.	Preceding noon.	Mid.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
	0·43000 +					Winter.							
1899. Months.													
Jan. ...	840	846	845	844	844	844	843	843	842	841	841	841	841
Feb. ...	841	844	843	843	842	843	842	842	841	840	841	841	841
March ..	848	866	865	864	864	863	862	861	862	861	859	855	850
Oct. ...	863	871	870	869	869	868	867	868	869	869	867	864	861
Nov. ...	820	825	826	827	826	826	826	824	825	825	823	822	822
Dec. ...	827	830	830	830	830	829	830	830	830	829	828	827	827
Means	840	847	847	846	846	846	845	845	845	844	843	842	840
						Summer.							
April ...	843	865	863	863	863	863	863	864	864	864	859	854	846
May ...	843	861	861	860	860	860	860	862	860	858	851	843	840
June ...	840	851	850	849	849	847	847	846	846	844	840	837	831
July ...	852	866	864	863	862	862	863	861	861	859	857	854	847
Aug. ...	841	856	855	855	854	854	854	854	854	851	847	841	838
Sept. ...	855	868	868	867	866	866	866	866	867	865	859	857	855
Means	846	861	860	860	859	859	859	859	859	857	852	848	843

Table VI.—Diurnal Inequality of the

Hours	Mid.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
					Summer Means.							
	+ ·00003	+ ·00002	+ ·00002	+ ·00001	+ ·00001	+ ·00001	+ ·00001	+ ·00001	− ·00001	− ·00006	− ·00010	− ·00015
					Winter Means.							
	+ ·00001	+ ·00001	·00000	·00000	·00000	− ·00001	− ·00001	− ·00001	− ·00002	− ·00003	− ·00004	− ·00006
					Annual Means.							
	+ ·00002	+ ·90001	+ ·00001	·00000	·00000	·00000	·00000	·00000	− ·00001	− ·00004	− ·00007	− ·00010

Note.—When the sign is + the

for Temperature), as determined from the selected quiet Days in 1899. Year = 0·43852.)

Noon.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Mid.	Succeeding noon.
						Winter.							
841	842	845	847	847	848	846	846	846	845	845	844	844	839
841	839	840	841	842	842	842	843	841	842	841	842	842	841
851	853	861	864	871	874	872	872	871	869	868	866	864	848
861	862	864	871	873	872	871	871	871	871	870	870	870	857
825	828	831	832	831	831	830	829	828	828	827	827	827	821
828	830	831	833	834	834	834	834	833	833	833	833	832	825
841	842	845	848	850	850	849	849	848	848	847	847	847	839
						Summer.							
843	846	853	859	863	867	869	868	867	866	866	865	864	842
841	846	851	859	862	864	865	864	864	862	860	859	858	835
836	841	849	854	858	859	862	862	860	857	852	849	849	829
847	852	857	860	866	869	871	873	872	870	868	867	865	850
838	843	851	858	862	863	863	861	859	857	855	854	854	839
854	857	863	865	869	870	869	870	870	869	869	867	866	849
843	847	854	859	863	865	867	866	865	864	862	860	859	841

Vertical Force as deduced from Table V.

Noon	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Mid.
					Summer Means.							
−·00015	−·00010	−·00004	+·00001	+·00005	+·00007	+·00009	+·00008	+·00007	+·00006	+·00004	+·00002	+·00001
					Winter Means.							
−·00005	−·00003	·00000	+·00002	+·00004	+·00004	+·00003	+·00003	+·00002	+·00002	+·00002	+·00001	+·00001
					Annual Means.							
−·00010	−·00007	−·00002	+·00002	+·00005	+·00006	+·00006	+·00006	+·00005	+·00004	+·00003	+·00002	+·00001

reading is above the mean.

Table VII.—Hourly Means of the Inclination, calculated from the Horizontal

Hours	Preceding noon.	Mid.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
		67° +					Winter.						
1899. Months.	′	′	′	′	′	′	′	′	′	′	′	′	′
Jan.....	15·2	15·4	15·3	15·2	15·1	15·0	14·8	14·8	14·8	14·8	15·2	15·2	15·2
Feb.....	15·3	15·0	15·1	15·1	15·0	15·0	14·9	14·8	14·7	14·7	15·1	15·2	15·3
March..	15·9	15·7	15·7	15·8	15·8	15·7	15·4	15·4	15·4	15·7	16·2	16·4	16·4
Oct.....	15·4	14·4	14·3	14·4	14·4	14·4	14·2	14·3	14·4	14·9	15·2	15·4	15·4
Nov. ...	13·4	13·4	13·3	13·3	13·1	12·9	12·9	12·8	13·0	13·4	13·6	13·8	13·9
Dec.....	13·3	13·2	13·3	13·2	13·0	12·9	12·9	12·9	12·9	12·9	13·0	13·1	13·2
Means..	14·7	14·5	14·5	14·5	14·4	14·3	14·2	14·2	14·2	14·4	14·7	14·9	14·9
							Summer.						
	′	′	′	′	′	′	′	′	′	′	′	′	′
April...	16·5	15·5	15·5	15·5	15·4	15·5	15·4	15·5	15·7	16·0	16·4	16·6	16·6
May....	16·0	14·9	15·0	14·9	15·1	15·1	15·3	15·6	16·1	16·6	16·7	16·6	16·4
June ...	15·5	14·3	14·4	14·4	14·5	14·5	14·4	14·7	15·0	15·3	15·4	15·4	15·2
July....	15·5	14·8	14·8	14·8	14·7	14·7	14·9	15·1	15·3	15·6	15·7	15·7	15·4
Aug. ...	14·7	14·3	14·3	14·3	14·4	14·4	14·6	14·8	15·2	15·6	15·8	15·6	15·3
Sept....	15·6	14·4	14·4	14·4	14·4	14·5	14·6	14·8	15·3	15·7	16·2	16·3	15·9
Means..	15·6	14·7	14·7	14·7	14·8	14·8	14·9	15·1	15·4	15·8	16·0	16·0	15·8

Table VIII.—Diurnal Inequality of the

Hours	Mid.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
					Summer Means.							
	′	′	′	′	′	′	′	′	′	′	′	′
	−0·3	−0·2	−0·2	−0·2	−0·2	−0·1	+0·1	+0·5	+0·9	+1·1	+1·1	+0·9
					Winter Means.							
	′	′	′	′	′	′	′	′	′	′	′	′
	+0·1	+0·1	+0·1	0·0	−0·1	−0·3	−0·3	−0·2	0·0	+0·3	+0·4	+0·5
					Annual Means.							
	′	′	′	′	′	′	′	′	′	′	′	′
	−0·1	−0·1	−0·1	−0·1	−0·1	−0·2	−0·1	+0·1	+0·4	+0·7	+0·7	+0·7

NOTE.—When the sign is +

and Vertical Forces (Tables III and V). (The Mean for the Year = 67° 14′·7.)

Noon.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Mid.	Succeeding noon.
						Winter.							
′	′	′	′	′	′	′	′	′	′	′	′	′	′
15·0	14·8	14·9	15·2	15·4	15·2	15·1	15·0	15·1	15·1	15·2	15·2	15·1	14·7
15·1	14·8	14·6	14·8	15·0	15·0	14·9	14·9	14·7	14·7	14·7	14·8	14·7	15·1
16·1	15·7	15·7	15·7	15·9	16·1	15·9	15·8	15·8	15·9	15·8	15·6	15·6	16·0
15·2	15·0	14·6	14·6	14·7	14·5	14·4	14·3	14·2	14·2	14·2	14·3	14·2	14·7
13·7	13·4	13·3	13·2	13·1	13·0	12·9	12·9	13·0	13·0	13·1	13·1	13·1	13·6
13·2	13·1	13·3	13·2	13·1	13·0	13·0	12·9	13·0	13·0	13·1	13·1	13·0	12·8
14·7	14·5	14·4	14·5	14·5	14·5	14·4	14·3	14·3	14·3	14·4	14·3	14·3	14·5
						Summer.							
′	′	′	′	′	′	′	′	′	′	′	′	′	′
16·3	16·0	15·7	15·4	15·4	15·5	15·1	15·3	15·3	15·2	15·2	15·3	15·2	16·4
15·6	15·1	14·9	15·0	15·1	15·1	15·0	14·7	14·6	14·7	14·7	14·7	14·7	15·2
15·1	14·9	14·8	14·8	14·5	14·4	14·1	13·9	13·9	14·0	14·0	14·0	14·2	14·9
15·1	15·0	14·8	14·5	14·7	14·6	14·6	14·4	14·3	14·3	14·4	14·5	14·5	15·1
14·9	14·7	14·5	14·5	14·6	14·4	14·3	13·8	13·7	13·7	13·9	13·8	13·9	14·9
15·2	14·8	14·5	14·4	14·4	14·4	14·3	14·2	14·3	14·4	14·3	14·3	14·3	15·4
15·4	15·1	14·9	14·8	14·8	14·7	14·6	14·4	14·3	14·4	14·4	14·4	14·5	15·3

Inclination as deduced from Table VII.

Noon	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Mid.
					Summer Means.							
′	′	′	′	′	′	′	′	′	′	′	′	′
+0·4	+0·1	−0·1	−0·2	−0·2	−0·2	−0·4	−0·6	−0·6	−0·6	−0·5	−0·5	−0·5
					Winter Means.							
′	′	′	′	′	′	′	′	′	′	′	′	′
+0·3	0·0	0·0	0·0	+0·1	0·0	−0·1	−0·1	−0·1	−0·1	−0·1	−0·1	−0·2
					Annual Means.							
′	′	′	′	′	′	′	′	′	′	′	′	′
+0·4	+0·1	−0·1	−0·1	0·0	−0·1	−0·2	−0·3	−0·4	−0·3	−0·3	−0·3	−0·3

the reading is above the mean.

APPENDIX Ia.

MEAN VALUES, for the years specified, of the Magnetic Elements at Observatories whose Publications are received at Kew Observatory.

Place.	Latitude.	Longitude.	Year.	Declination.	Inclination.	Horizontal Force. C.G.S. Units.	Vertical Force C.G.S. Units.
Pawlowsk	59° 41′ N.	30° 29′ E.	1897	0° 25′·6 E.	70° 40′·2 N.	·16514	·47078
Katharinenburg	56 49 N.	60 38 E.	1897	9 51·2 E.	70 40·0 N.	·17812	·50771
Kasan	55 47 N.	49 8 E.	1892	7 30·8 E.	68 36·2 N.	·18551	·47345
Copenhagen ...	55 41 N.	12 34 E.	1898	10 19·8 W.	68 43·0 N.	·17467	·44839
Stonyhurst	53 51 N.	2 28 W.	1898	18 21·9 W.	68 53·6 N.	·17260	·44713
Hamburg.....	53 34 N.	10 3 E.	1896	11 36·7 W.	67 38·8 N.	·18061	·43921
Wilhelmshaven	53 32 N.	8 9 E.	1898	12 37·5 W.	67 47·4 N.	·18045	·44196
			1899	12 31·9 W.	67 45·0 N.	·18072	·44173
Potsdam	52 23 N.	13 4 E.	1898	10 5·0 W.	66 35·3 N.	·18794	·43408
Irkutsk.....	52 16 N.	104 16 E.	1897	2 3·6 E.	70 12·4 N.	·20145	·55975
Utrecht	52 5 N.	5 11 E.	1897	14 5·2 W.	67 1·9 N.	·18511	·43676
Kew.....	51 28 N.	0 19 W.	1899	16 57·1 W.	67 14·7 N.	·18393	·43852
Greenwich*....	51 28 N.	0 0	1898	16 39·2 W.	67 11·9 N.	·18387	·43737
Uccle (Brussels)	50 48 N.	4 21 E.	1898	14 22·4 W.	66 17·0 N.	·18930	·43088
Falmouth	50 9 N.	5 5 W.	1898	18 37·5 W.	66 51·8 N.	·18627	·43571
Prague	50 5 N.	14 25 E.	1898	9 15 8 W.	—	·19906	—
St. Helier (Jersey).....	49 12 N.	2 5 W.	1899	17 3·7 W.	65 49·4 N.	—	—
Parc St. Maur (Paris)	48 49 N.	2 29 E.	1897	14 58·6 W.	64 59·6 N.	·19717	·42270
Vienna.....	48 15 N.	16 21 E.	1898	8 24·1 W.	—	·20797	—
			1897	7 44·3 W.	—	·21114	—
O'Gyalla(Pesth)	47 53 N.	18 12 E.	1898	7 38·2 W.	—	·21114	—
			1899	7 33·9 W.	—	·21129	—
Odessa.....	46 26 N.	30 46 E.	1897	4 47·3 W.	62 30·9 N.	·22039	·42372
Pola.....	44 52 N.	13 51 E.	1898	9 30·9 W.	—	·22111	—
Nice†	43 43 N.	7 16 E.	1898	12 8·2 W.	60 13·6 N.	·22349	·39065
			1899	12 4·0 W.	60 11·7 N.	·22390	·39087
Toronto.....	43 40 N.	79 30 W.	1897	4 53·0 W.	—	·16650	—
Perpignan.....	42 42 N.	2 53 E.	1896	13 55·3 W.	60 5·9 N.	·22398	·38948
Rome.....	41 54 N.	12 27 E.	1891	10 45·1 W.	58 4·6 N.	·2324	·3730
Tiflis	41 43 N.	44 48 E.	1896	1 53·7 E.	55 48·1 N.	·25670	·37775
Capodimonte (Naples)	40 52 N.	14 15 E.	1897	9 26·3 W.	56 31·4 N.	·24075	·36406
Madrid	40 25 N.	3 40 W.	1896	16 1·7 W.	—	—	—
			1897	15 56·9 W.	—	—	—
Coimbra.....	40 12 N.	8 25 W.	1897	17 32·3 W.	59 36·3 N.	·22658	·38628
			1898	17 27·9 W.	59 33·6 N.	·22691	·38613

* Observations taken on site of new magnetic pavilion. In case of Inclination 3-inch needles alone employed.

† In last year's table the Declination at Nice should be 12° 12·8′ (not 12° 18·8′).

APPENDIX Ia—*continued.*

Place.	Latitude.	Longitude.	Year.	Declination.	Inclination.	Horizontal Force. C.G.S. Units.	Vertical Force. C.G.S. Units.
Washington ..	38 55 N.	77 4 W.	1894	3 39·9 W.	70 34·3 N.	·19979	·56646
Lisbon.....	38 43 N.	9 9 W.	1899	17 22·6 W.	57 58·4 N.	·23451	·37484
Zi-ka-wei	31 12 N.	121 26 E.	1896	2 18·1 W.	45 52·7 N.	·32676	·33693
Havana.....	23 8 N.	82 25 W.	1898	3 10·8 E.	52 30·7 N.	·31166	·40634
Hong Kong....	22 18 N.	114 10 E.	1898	0 22·6 E.	31 33·3 N.	·36607	·22481
Tacubaya.....	19 24 N.	99 12 E.	1895	7 45·6 E.	44 22·2 N.	·33428	·32764
Colaba(Bombay)	18 54 N.	72 49 E.	1896	0 33·8 E.	20 55·6 N.	·37463	·14326
Manila.....	14 35 N.	120 58 E.	1897	0 51·4 E.	16 33·2 N.	·37910	·11268
Batavia	6 11 S.	106 49 E.	1897	1 18·6 E.	29 37·8 S.	·36767	·20913
Mauritius	20 6 S.	57 33 E.	1897	9 43·6 W.	54 27·4 S.	·23900	·33452
Melbourne.....	37 50 S.	144 58 E.	1898	8 20·1 E.	67 22·4 S.	·23364	·56050

APPENDIX II.—Table I.

Mean Monthly Results of Temperature and Pressure. Kew Observatory. 1899.

Months.	Thermometer.								Barometer.*					Mean vapour-tension.
	Mean.	Means of—			Absolute Extremes.				Mean.	Absolute Extremes.				
		Max.	Min.	Max. and Min.	Max.	Date.	Min.	Date.		Max.	Date.	Min.	Date.	
1899.						d. h.		d. h.	ins.	ins.	d. h.	ins.	d. h.	in.
Jan.....	42·8	47·3	37·9	42·6	55·4	21 1 P.M.	28·8	6 2 A.M.	29·842	30·692	25 9 P.M.	28·841	2 8 A.M.	·225
Feb.	41·6	47·6	36·2	41·9	62·3	10 1 P.M.	21·9	28 1 ,,	29·909	30·729	28 9 A.M.	29·171	13 7 P.M.	·216
March..	39·9	48·1	32·3	40·2	59·8	31 3 ,,	22·5	21 7 ,,	30·097	30·687	1 10 ,,	29·019	9 4 A.M.	·195
April...	47·4	54·2	41·2	47·7	63·8	1 4 ,,	32·2	18 6 ,,	29·834	30·338	23 1 ,,	28·885	14 1 ,,	·251
May ...	51·5	59·9	43·3	51·6	71·3	31 4 & 5 P.M.	34·8	4 5 ,,	30·026	30·488	28 11 ,,	29·413	15 4 ,, & 10 ,,	·276
June...	60·9	70·7	51·0	60·9	80·6	5 4 P.M.	42·6	14 4 ,, 15 4 ,,	30·067	30·447	8 10 ,,	29·381	20 6 P.M.	·354
July ...	66·1	75·4	57·0	66·2	86·4	21 3 ,,	50·4	5 4 ,,	30·078	30·474	31 10 P.M.	29·523	1 11 A.M.	419
Aug....	65·7	75·8	56·4	66·1	87·3	15 3 ,,	48·2	22 5 ,,	30·096	30·463	1 0·5 A.M.	29·740	31 MIDT.	424
Sept....	57·8	66·1	49·8	58·0	84·2	5 5 ,,	35·2	29 5 ,,	29·864	30·249	11 7 ,,	29·262	30 4 A.M.	·344
Oct.....	48·6	56·6	41·5	49·1	62·2	1 2 ,,	31·0	14 7 ,,	30·074	30·445	21 9 P.M.	29·141	1 4 P.M.	·295
Nov. ...	47·3	52·5	41·4	47·0	60·8	4 2 ,,	27·8	30 7 ,,	30·198	30·729	17 10 A.M.	29·390	8 7 A.M.	·280
Dec. ...	37·0	41·1	32·4	36·8	54·0	6 9 ,,	21·3	14 6 ,,	29·910	30·578	3 10 ,,	28·436	29 5 P.M.	·193
Yearly Means	50·6	57·9	43·4	50·7	..	....	..	....	30·000	..	....	..	..	·289

* Reduced to 32° at M.S.L.

This table has been compiled at the Meteorological Office from values intended for publication in the volume of "Hourly Means" for 1899.

Meteorological Observations.—Table II.

Kew Observatory.

Months.	Mean amount of cloud (0=clear, 10=overcast).	Rainfall.*			Weather. Number of days on which were registered							Wind.† Number of days on which it was								
		Total.	Maximum.	Date.	Rain. ‡	Snow.	Hail.	Thunderstorms.	Clear sky.	Overcast sky.	Gales.§	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.‖
1899.		ins.	ins.																	
January.....	6·4	2·385	0·420	13	19	1	1	..	7	14	5	1	7	..	..	6	10	5	2	2
February....	5·4	2·020	0·380	6	9	1	..	..	10	10	5	1	2	8	4	6	4	1	2	7
March.....	5·4	0·560	0·140	25	10	3	..	..	7	8	1	4	1	6	1	1	7	6	5	6
April.....	7·5	2·375	0·320	24	20	2	..	..	1	16	..	3	..	1	1	3	9	8	5	4
May.....	6·2	1·465	0·445	14	11	..	..	1	3	9	1	5	6	4	1	5	8	2	..	4
June.....	5·2	1·610	0·520	28	6	..	..	1	8	9	..	7	4	4	3	5	1	3	3	4
July.....	5·6	0·610	0·140	10	9	..	..	3	6	9	..	5	1	3	..	4	5	8	5	5
August.....	4·5	0·445	0·190	29	6	..	..	..	7	4	..	1	3	12	5	..	5	2	3	1
September...	6·0	2·165	0·900	29	14	..	..	2	3	8	..	3	1	1	..	3	7	12	3	4
October.....	4·9	1·975	1·055	27	8	..	..	..	9	9	..	3	4	10	..	4	6	2	2	12
November...	8·0	3·980	1·350	3	8	..	..	..	1	19	1	2	2	1	1	6	9	7	2	6
			1·250	5																
December ...	7·5	1·255	0·260	1	15	1	..	..	4	20	1	4	3	7	4	3	5	3	2	8
Totals and means.	6·0	20·845			135	8	1	7	66	135	14	39	34	57	20	46	76	59	34	63

* Measured at 10 A.M. daily by gauge 1·75 feet above ground.

† As registered by the anemograph.

‡ The number of rainy days are those on which 0·01 inch rain or melted snow was recorded.

§ In a "gale" the mean wind velocity has exceeded 35 miles an hour in at least one hour of the twenty-four.

‖ In a "calm" the mean wind velocity for the twenty-four hours has not exceeded 5 miles an hour.

Meteorological Observations.—Table III.

Kew Observatory.

Months.	Bright Sunshine.				Maximum temperature in sun's rays. (Black bulb *in vacuo*.)			Minimum temperature on the ground.			Horizontal movement of the air.*		
	Total number of hours recorded.	Mean percentage of possible sunshine.	Greatest daily record.	Date.	Mean.	Highest.	Date. †	Mean.	Lowest.	Date. ‡	Average hourly velocity.	Greatest hourly velocity.	Date.
1899.	h. m.		h. m.		deg.	deg.		deg.	deg.		miles.	miles.	
January	70 48	27	6 18	9	69	90	22	31	18	25	14·9	48	21
February	80 54	29	7 48	22	79	105	10	28	13	26	12·4	46	13
March	119 12	33	9 24	22	90	116	29	23	9	25	9·1	37	29
April	131 0	31	12 24	19	106	118	25, 29	35	20	19	11·2	33	6
May	219 12	46	14 54	31	119	128	18	36	20	4	10·8	35	17
June	253 6	51	15 6	15	124	135	26, 28	43	28	15	8·3	24	20, 30
July	264 42	53	14 30	30	131	147	9	51	41	14	8·5	26	1
August	261 42	58	13 12	21	125	137	15	48	38	21, 22	10·2	32	4
September	167 0	44	12 18	4	115	138	5	44	28	29	9·4	26	22
October	103 48	31	9 42	13	89	119	3	35	22	14	7·5	34	15
November	51 36	19	8 18	1	73	96	1, 2, 8	34	21	18	9·2	44	3
December	40 30	17	6 36	31	56	84	1	25	6	14	9·0	40	29
Totals and Means	1763 30	37	..	..	98	..	..	36	..	..	10·0	..	..

* As indicated by a Robinson's anemograph, 70 feet above the general surface of the ground, the original factor 3 being used.
† Read at 10 A.M., and entered to previous day. ‡ Read at 10 A.M., and entered to same day.

APPENDIX III.—Table I.

Register of principal Seismograph Disturbances. 1899.

No. in Kew register.	Date.	Commencement of P.T.'s.*	Duration of P.T.'s.*	1st maximum.	2nd maximum.	Amplitude in seconds of arc.	Total duration of disturbance.
		h. m.	m.	h. m.	h. m.		h. m.
49	Jan. 14	2 58·2	27·2	3 26·5	3 28·2	1·03	1 11·5
50	,, 22	8 22·2	5·6	8 29·1	—	0·77	0 27·5
52	,, 24–25	23 47·7	43·4	0 35·6	0 42·6	2·44	2 59·6
89	April 12	17 47·2	29·6	18 35·1	—	0·46	1 44·6
112	June 5	15 15·4	30·0	15 46·2	15 55·2	0·58	1 11·6
114	,, 14	11 28·6	22·5	11 52·0	11 59·1	1·90	2 9·4
124	July 12	1 55·3	10·8	2 12·3	2 13·3	1·12	1 4·0
125	,, 14	13 31·4	21·9	13 54·0	13 56·8	1·60	3 35·6
142	Sept. 4	0 33·6	8·3	1 3·0	1 7·3	7·49	2 49·2
144	,, 10	17 15·3	7·3	17 50·1	17 53·5	2·18	1 39·0
145	,, 10	21 1·6	58·9	22 20–21	22 25·6	exceeded 10·80	3 0·0
149	,, 20	2 16·7	4·6	2 21·8	2 27·5	3·20	1 22·8
150	,, 23	11 23·3	20·2	11 46·7	11 49·8	0·70	1 19·2
151	,, 23	14 1·8	19·0	14 24·3	14 26·3	0·70	1 12·4
152	,, 29	17 23·2	5·3	17 35·5	17 45·7	0·51	2 13·8
168	Nov. 23	10 1·0	9·8	10 10·8	10 11·8	1·04	1 4·5
169	,, 24	19 5·5	19·1	19 41·4	19 43·4	0·69	0 59·5
179	Dec. 31	10 59·2	8·9	11 13·7	—	0·88	0 53·3
180	,, 31	20 37·1	18·7	20 58·2	21 2·7	0·50	0 57·7

* P.T.'s = preliminary tremors. The times recorded are G.M.T.; midnight = 0 or 24 hours.
The figures given above are obtained from the photographic records of a Milne Horizontal Pendulum; they represent E—W displacements.

APPENDIX IV.—Table I.

RESULTS OF WATCH TRIALS. Performance of the 50 Watches which obtained the highest number of marks during the year.

Watch deposited by	Number of watch.	Escapement, balance spring, &c.	Mean daily rate.					Mean variation of daily rate. ±	Mean change of rate for 1°F.	Difference between extreme gaining and losing rates.	Marks awarded for			Total Marks.
			Pendant up.	Pendant right.	Pendant left.	Dial up.	Dial down.				Daily variation of rate.	Change of rate with change of position.	Temperature compensation.	
											0—40	0—40	0—20	0—100.
			secs.	secs.	secs.	secs.	secs.	secs.	secs.	secs.				
S. Smith & Son, London	238–99	D.r., fusee, s.o., "Tourbillon" lever	+0·6	−0·0	−0·4	−1·1	−0·2	0·4	0·03	5·0	32·6	38·2	17·9	88·7
Montandon-Robert, Geneva	1078	D.r., g.b., s.o.	−1·5	−1·9	−2·9	−2·0	−1·6	0·3	0·05	4·5	33·2	38·5	16·5	88·2
S. Yeomans, Coventry	76656	S.r., g.b., s.o., "Karrusel"	+0·9	+2·1	+1·3	+0·9	+1·6	0·4	0·04	4·0	31·5	38·4	18·0	87·9
Montandon-Robert, Geneva	1112	D.r., g.b., s.o., "Karrusel"	−1·9	−1·6	−1·5	−1·6	−2·4	0·3	0·06	3·7	33·0	38·9	15·8	87·7
S. Yeomans, Coventry	76153	S.r., g.b., s.o., "Karrusel"	+3·2	+3·0	+3·7	+2·0	+3·9	0·5	0·01	4·2	29·7	37·9	19·3	86·9
Chas. Frodsham & Co., London	08647	D.r., fusee, s.o., "Tourbillon" lever	+1·8	+1·1	+1·0	+0·9	+3·0	0·4	0·04	5·2	31·9	37·3	17·5	86·7
Fridlander, Coventry	14846	S.r., g.b., s.o.	+0·4	−0·2	−0·3	+2·2	+2·6	0·3	0·05	3·7	34·8	35·4	16·4	86·6
" "	25534	S.r., g.b., s.o., "Karrusel"	−0·0	−0·3	−0·3	−3·8	+2·7	0·3	0·04	8·2	34·5	34·5	17·5	86·5
S. Yeomans, Coventry	76657	S.r., g.b., s.o., "Karrusel"	−1·8	−1·3	−1·2	−1·9	−3·4	0·4	0·05	4·2	32·3	37·6	16·6	86·5
Montandon-Robert, Geneva	1095	D.r., g.b., s.o., minute repeater	−1·5	−3·1	−1·0	−1·9	−0·8	0·4	0·06	5·0	32·6	37·3	16·1	86·0
Ehrhardt, Ltd., Birmingham	272874	S.r., g.b., s.o.	−1·0	−2·0	−0·5	+0·1	+0·8	0·5	0·01	4·5	29·3	36·8	19·9	86·0
Montandon-Robert, Geneva	1060	D.r., g.b., s.o.	+3·1	+0·7	+1·9	+3·5	+2·8	0·4	0·05	4·2	32·4	36·5	16·9	85·8
S. Smith & Son, London	1899–1	G.b., s.o., "Tourbillon" chronometer	−1·5	+0·4	−2·3	−0·4	+0·7	0·3	0·06	4·8	33·7	35·9	16·1	85·7
W. Matthews, Coventry	96966	S.r., g.b., s.o., "Karrusel"	−0·3	−0·0	−0·5	−0·3	+0·7	0·5	0·05	4·5	30·4	38·5	16·7	85·6
J. White & Son, Coventry	34072	D.r.,g.b., s.o.	+0·3	−0·8	−0·5	−0·8	+2·1	0·4	0·04	7·0	32·0	36·4	17·1	85·5
S. Smith & Son, London	229–309 / 25574	S.r., g.b., s.o., non-magnetic "Karrusel"	+5·4	+5·1	+4·3	+7·2	+3·7	0·4	0·01	5·5	29·6	36·3	19·5	85·4
W. Matthews, Coventry	97747	S.r., g.b., s.o., "Karrusel"	−1·8	−1·1	−1·4	+0·7	−1·8	0·4	0·05	4·0	31·3	37·2	16·7	85·2
J. White & Son, Coventry	36645	S.r., g.b., s.o.	+0·9	+2·5	+1·5	+1·3	−0·5	0·3	0·09	6·7	34·2	36·9	13·9	85·0
Bonniksen, Coventry	55167	S.r., g.b., s.o., "Karrusel"	−3·6	−3·8	−4·5	−4·5	−5·1	0·5	0·06	4·5	30·7	38·0	16·3	85·0
Montandon-Robert, Geneva	1099	D.r.,g.b., s.o., chronograph	+0·5	−1·1	−0·5	+0·9	+2·4	0·3	0·06	5·2	33·0	36·0	15·9	84·9
Fridlander, Coventry	25577	S.r., g.b., s.o., "Karrusel"	−4·9	−5·3	−6·2	−4·0	−6·5	0·3	0·08	3·5	33·2	36·8	14·7	84·7
Newsome & Co., Coventry	131067	S.r., g.b., s.o., "Karrusel"	+3·6	+4·0	+4·8	+4·8	+3·4	0·6	0·02	3·2	28·5	37·8	18·4	84·7
Chas. J. Hill, Coventry	150188	S.r., g.b., s.o., "Karrusel"	+0·8	+0·5	+0·7	+1·5	+5·0	0·4	0·02	6·0	31·3	34·6	18·7	84·6
Fridlander, Coventry	14467	S.r., g.b., s.o.	+1·6	+2·4	+2·2	+1·9	+5·0	0·4	0·07	6·7	33·0	36·1	15·3	84·4
Matthews, Coventry	97263	S.r., g.b., s.o., "Karrusel"	+0·4	+1·6	+0·4	+3·6	+2·8	0·4	0·04	5·3	31·3	35·4	17·4	84·1

Table I—*continued.*

Watch deposited by	Number of watch.	Escapement, balance spring, &c.	Mean daily rate.					Mean variation of daily rate. ±	Mean change of rate for 1° F.	Difference between extreme gaining and losing rates.	Marks awarded for			Total Marks.
			Pendant up.	Pendant right.	Pendant left.	Dial up.	Dial down.				Daily variation of rate.	Change of rate with change of position.	Temperature compensation.	
											0—40	0—40	0—20	0—100.
			secs.	secs.	secs.	secs.	secs.	secs.	secs.	secs.				
Fridlander, Coventry	25583	S.r., g.b., s.o., "Karrusel"	+0·1	−0·3	+0·1	−0·2	+2·6	0·4	0·07	7·5	31·7	36·6	15·6	83·9
Matthews, Coventry	36738	S.r., g.b., s.o., "Karrusel"	−0·2	−0·4	−0·2	−0·2	−0·6	0·6	0·07	4·7	28·3	39·4	16·1	83·8
,, ,,	36742	S.r., g.b., s.o., "Karrusel"	+4·0	+1·4	+1·0	−0·1	+1·8	0·5	0·05	11·2	30·7	35·9	16·9	83·5
J. White & Son, Coventry	35382	S.r., g.b., s.o., "Karrusel"	−2·6	−1·8	−1·4	−1·8	−0·6	0·5	0·06	5·8	29·3	37·9	16·3	83·5
Fridlander, Coventry	25511	S.r., g.b., s.o., "Karrusel"	+0·5	+0·5	−0·0	−2·7	+1·4	0·3	0·09	8·0	33·2	35·8	14·3	83·3
S. Smith & Son, London	192 B10	S.r., g.b., s.o., "Karrusel"	−0·3	+0·3	−0·1	+1·1	+0·8	0·4	0·09	6·5	31·3	38·1	13·9	83·3
Fridlander, Coventry	25580	S.r., g.b., s.o., "Karrusel"	+0·3	−0·2	+0·3	+3·5	+3·8	0·3	0·05	5·7	33·4	33·3	16·5	83·2
A. Taylor, London	7558	D.r., g.b., s.o., annular "Tourbillon"	+1·2	+1·8	+1·9	+1·3	+1·7	0·4	0·11	6·2	31·8	38·9	12·5	83·2
J. White & Son, Coventry	33426	S.r., g.b., s.o.	+0·1	−2·5	−1·1	−0·4	−0·6	0·5	0·06	4·7	30·3	37·0	15·9	83·2
Usher & Cole, London	29932	S.r., g.b., s.o.	+2·0	+3·4	+2·7	+2·1	+2·6	0·5	0·06	6·7	29·1	38·3	15·7	83·1
S. Smith & Son, London	229–308 25578	S.r., g.b., s.o., "Karrusel," non-magnetic	+5·4	+4·8	+5·0	+3·6	+2·0	0·6	0·01	5·7	27·9	35·7	19·5	83·1
W. Matthews, Coventry	36688	S.r., g.b., s.o., "Karrusel"	+1·2	+0·9	+1·3	+2·3	+3·9	0·5	0·05	4·8	30·3	36·2	16·5	83·0
R. Waddington, Coventry	22186	S.r., g.b., s.o., "Karrusel"	+3·2	+3·7	+3·2	+2·6	+2·8	0·6	0·06	5·5	28·3	38·7	15·9	82·9
Montandon-Robert, Geneva	1072	D.r., g.b., s.o.	−1·1	+0·7	+0·9	+3·0	+3·4	0·4	0·06	6·2	32·7	34·2	15·9	82·8
S. Smith & Son, London	192 A2	S.r., g.b., s.o., "Karrusel"	+2·0	+3·0	+1·5	+0·2	+1·5	0·6	0·03	5·0	27·3	37·2	18·3	82·8
Matthews, Coventry	36326	S.r., g.b., s.o.	−0·7	−1·6	−1·3	+2·0	−1·6	0·6	0·03	5·8	28·9	35·8	17·9	82·6
Rotherhams, Coventry	23608	S.r., g.b., s.o.	+0·8	−0·5	−0·5	+1·8	+2·8	0·6	0·02	6·7	28·7	35·4	18·5	82·6
Stauffer, Son, & Co., London	169340	D.r., g.b., s.o., chronograph	+5·8	+3·4	+1·6	+4·1	+4·4	0·5	0·04	6·8	29·5	35·7	17·3	82·5
John Hewitt, Coventry	56179	S.r., g.b., s.o., "Karrusel"	+1·1	+1·3	+0·8	+0·5	+2·2	0·6	0·07	6·8	29·0	38·2	15·2	82·4
J. White & Son, Coventry	35765	D.r., g.b., s.o.	−1·3	−2·8	−0·6	+0·6	+1·8	0·4	0·06	6·2	31·6	34·5	16·2	82·3
Ehrhardt, Ltd., Birmingham	284583	S.r., g.b., s.o.	+2·0	+3·8	+4·4	+5·3	+5·9	0·5	0·05	5·5	29·8	35·6	16·9	82·3
J. White & Son, Coventry	35888	D.r., g.b., s.o.	+2·3	+1·6	−1·4	+1·8	+2·1	0·4	0·08	5·5	31·6	35·7	14·9	82·2
,, ,, ,,	35841	S.r., g.b., s.o., "Karrusel"	+5·9	+5·2	+5·2	+6·2	+9·5	0·4	0·07	8·5	31·5	35·1	15·6	82·2
Baume & Co., London	254188	D.r., g.b., s.o., chronograph	+0·2	+1·2	−4·3	−1·4	−0·5	0·5	0·03	7·0	30·4	33·8	17·8	82·0
Johannsen & Co., London	6514	S.r., g.b., s.o.	−0·1	−0·1	−0·9	+1·8	−0·1	0·6	0·06	6·0	28·7	37·4	15·8	81·9

In the above List, the following abbreviations are used, viz.:—s.r. for single roller; d.r. for double roller; g.b. for going barrel; s.o. for single overcoil; + for gaining rate; − for losing rate.

Table II.

Highest Marks obtained by Complicated Watches during the year.

Description of watch.	Number.	Deposited by	Marks awarded for			Total marks.
			Variation.	Position.	Temperature.	
			0—40	0—40	0—20	0—100.
Minute and split seconds chronograph, repeater, and perpetual calendar, with phases of the moon	148-99	S. Smith and Son, London	25·9	29·6	14·9	70·4
" " " " (and clock watch)	13159	" "	17·6	30·3	17·3	65·2
Minute chronograph and minute repeater	2324	J. W. Benson, London	25·5	34·0	11·5	71·0
" " "	153-4	S. Smith and Son, London	29·9	28·1	12·5	70·5
" " "	153-5	" "	24·5	27·1	15·9	67·5
Minute and split seconds chronograph	1099	Montandon-Robert, Geneva	33·0	36·0	15·9	84·9
" " "	169340	Stauffer, Son, and Co., London	29·5	35·7	17·3	82·5
" " "	12609	Baume and Co., London	30·4	33·5	15·8	79·7
" " "	3483	Wales and McCulloch, London	29·4	35·4	14·5	79·3
" " "	36352	J. White and Son, Coventry	28·3	32·8	17·9	79·0
Minute and seconds chronograph	254188	Baume and Co., London	30·4	33·8	17·8	82·0
" " "	21633	Rotherhams, Coventry	28·1	35·1	16·4	79·6
" " "	29975	J. Player and Son, Coventry	27·9	38·3	12·5	78·7
" " "	6546	Army & Navy C. S., London	29·1	35·9	13·6	78·6

Table II—*continued.*

Description of watch.	Number.	Deposited by	Marks awarded for			Total marks.
			Variation.	Position.	Temperature.	
			0—40	0—40	0—20	0–100.
Minute repeater	1095	Montandon-Robert, Geneva ..	32·6	37·3	16·1	86·0
„ „	3443	Wales and McCulloch, London	28·5	33·9	15·2	77·6
„ „ (5 minute)	5240	Army & Navy C. S., London ..	29·8	34·6	12·0	76·4
"Non-magnetic"	229–309 25574	S. Smith and Son, London....	29·6	36·3	19·5	85·4
„	229–308 25578	„ „	27·9	35·7	19·5	83·1
„	25514	Fridlander, Coventry	32·0	34·2	14·7	80·9
„	192 C 225	S. Smith and Son, London....	30·4	34·3	15·6	80·3